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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/644,356 | 08/19/2003 | Tsai-Sheng Gau | 67,200-1053 | 8900 |

7590 10/04/2005

TUNG & ASSOCIATES
Suite 120
838 W. Long Lake Road
Bloomfield Hills, MI 48302

| EXAMINER | |
|---|---|
| BARRECA, NICOLE M | |
| **ART UNIT** | **PAPER NUMBER** |
| 1756 | |

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/644,356 | GAU ET AL. | |
| | Examiner | Art Unit | |
| | Nicole M. Barreca | 1756 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

1. Claims 1-25 are pending in this application.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4-13, 15-22, 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato (US 6,064,466).

4. An exposure mask is adapted to account for surface irregularities of a wafer's surface in order to improve planarization. The value for the residual resist thickness depends on the light intensity, pattern density, development time and type of resist used. The initial resist thickness is T (initial). Semiconductor substrate 10 with (topography) feature 11, such as a line and space pattern, is coated with a layer of resist 12. A mask 15 with different light transmittance portion is aligned with the feature and a radiation source exposes the resist through the mask. The exposed resist is developed. The mask allows less than the full intensity radiation to fall upon some regions of the resist and therefore less resist is removed. After development the surface of the resist 22 over feature 11 and that over substrate 10 are equalized (thickness topography altered). See col.2, 59-col.4, 2. and Figures 4A-E. The substrate may also have a narrow pit or indentation 31 (col.4, 3-25, Figures 5A-D). Mask of

Figure 6A includes a simple opaque portion 34 and intermediate transmittance portions, such as subresolution pattern and portion 39 (col.4, 26-61). Semiconductor wafer 43 includes multiples trenches 41. The mask portion above the thickest portion of the resist has the highest light transmittance (col.4, 62-col.5, 14, Figures 7A-C).

### *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato.

7. Sato does not disclose repeating the steps of determining the initial thickness through development. However the subsequent topography thickness and amount of planarization would be dependent on the final device being manufactured and required subsequent processing steps needed to produce such as device. It would be within the ordinary skill of one in the art to determine the optimal topography thickness as required for the specific device being manufactured and obvious to repeat the selective thickness alteration process, including the determination of the initial thickness through development, until such an optimal thickness was reached.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 1 above, and further in view of Lewis (US 4,822,722).

9. Sato is silent on the method used to measure the initial resist thickness. Lewis teaches that the thickness of a photoresist layer is known to be measured using interferometry, profilometry and elipsometry (col.6, 34-44). It would have been obvious to one of ordinary skill in the art to use interferometry, profilometry or elipsometry to measure the initial resist thickness in the method of Sato because Lewis teaches that these are all known suitable methods of resist thickness measurement.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 1 above, and further in view of Aronsatein (US 3,889,355).

11. Sato teaches exposing the photoresist by aligning a mask but is silent on the specific exposure method used. Aronsatein teaches that conventional resist exposure systems include contact printing, projection printing and step and repeat techniques (col.10, 3-10). It would have been obvious to one of ordinary skill in the art to expose the resist in the method of Sato using contact, projection or step and repeat techniques because Lewis teaches that these are all known conventional resist exposure systems.

12. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato as applied to claim 1 above, and further in view of Beyer (US 4,33,794).

13. Sato does not disclose the method to further include an etchback to produce plugs filling the vias. Beyer teaches that it is conventional in the art to use an oxygen plasma etchback in order to fill and protect trenches with a resist plug (col.11, 6-15). It would have been obvious to one of ordinary skill in the art use a resist etchback to fill and form via plugs because Beyer teaches that this is conventional method used in the art.

***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Primary Examiner
Art Unit 1756

9/26/05